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force is proportional to y^3 and y may be found from $\frac{\pi\tan^2\infty}{3}[m^3a^3-(x+y)^3]$ $=\frac{\pi\tan^2\infty}{3}(a^3-y^3)$ where ∞ is the semi-vertical angle of the cone.

$$y=-\frac{x}{2}+\sqrt{\frac{a^3(m^3-1)}{3x}-\frac{x^2}{12}}.$$

The equation of motion is $\frac{d^2x}{dt^2}=cy^3-g$.

Since, when $y=a$, $\frac{d^2x}{dt^2}=\frac{1-\rho}{\rho}g$, $c=\frac{g}{a^3\rho}$.

Substituting this and the value of y

$$\frac{d^2x}{dt^2}=\frac{g}{a^3\rho}\left[\left(\frac{a^3(m^3-1)}{3x}+\frac{2x^2}{3}\right)\sqrt{\frac{a^3(m^3-1}{3x}-\frac{x^2}{12}}-\frac{a^3(m^3-1)}{2}\right]-g.$$

Integrating,

$$\left(\frac{dx}{dt}\right)^3=\frac{2g}{a^3\rho}\left[-2x\left(\frac{a^3(m^3-1)}{3x}-\frac{x^2}{12}\right)^{\frac{3}{2}}-\frac{a^3(m^3-1)}{2}x\right]-2gx+c_1.$$

When $x=a(m-1)$, $\left(\frac{dx}{dt}\right)^2=2ga(m-1)\frac{1-\rho}{\rho}$.

$$\therefore\ c_1=\frac{3ag}{2\rho}(m^4-1).$$

When $y=0$ and, consequently, $x=a\sqrt[3]{m^3-1}$, $\frac{dx}{dt}=0$.

$$\therefore\ 0=\frac{2g}{a^3\rho}\left(-\frac{3a^4(m^3-1)^{\frac{4}{3}}}{4}\right)-2ga\sqrt[3]{m^3-1}+\frac{3ag}{2\rho}(m^4-1),\text{ and}$$

$$\rho=\frac{3[m^4-1-(m^3-1)\sqrt[3]{m^3-1}]}{4\sqrt[3]{m^3-1}}.$$

PROBLEMS.

16. **Proposed by A. H. BELL, Hillsboro, Illinois.**

An iron bar 20 feet long and weighing 2,000 lbs. leans against a wall at angles 30°, 45°, and 80°. How much pressure does the floor and wall receive?

17. **Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.**

Find the law of density of strings collected into a heap at the edge of a table with the end just over the edge, so that equal masses may always pass over in equal times.